

GAZOMET[®]

NOWOCZESNA TECHNIKA NIE TYLKO DLA GAZOWNICTWA



URZĄDZENIA CIŚNIENIOWE

The **GAZOMET** Corporation was founded in 1862. Since 1954, it has been manufacturing a variety of products for the needs of the Polish gas industry. In 1969, GAZOMET designed and manufactured the first Polish ball valves for natural gas, in the year 1974 the production of reduction-metering gas station started, with implementation of own-designed pressure vessels (gas filters, dust and liquid separators, heatexchangers and combined filter-heatexchangers).

The **GAZOMET** of today is an experienced manufacturer meeting various needs and demands of the gas & oil industry. The company's partnership with leading manufacturers, both in Poland and abroad, results in the state-of-the-art engineering solutions meeting the most rigorous requirements defined by the Customer.

The **GAZOMET** products are in conformity with the strictest technical standards, while assuring maximum safety during operation. The company has implemented and actively follows procedures of the ISO 9001 Quality System with regards to design, manufacturing and after-sales services of gas stations, gas reduction-metering stations, gas transmission accessories, fittings, safety systems for gas networks, process and transmission pipelines, components and fixtures, pressure vessels, gas odorising stations, gas meters, as well as steel structures and crane facilities.

GAZOMET has implemented and strictly observes the system of quality assurance under the Pressure Equipment Directive 97/23/EC, which allows the products to be manufactured in accordance with the recognized standards and be CE-labelled (DVGW CE 0085, UDT Urząd Dozoru Technicznego CE 14233).

Flexibility of applied technical solutions, manufacturing precision, efficient order processing and short lead time combined with expert service are a strong foundation of the company's achievements.

We are kindly inviting you to have your share in our successes, offering you our partnership in various projects.

Your participation in creative design and engineering programs may bring significant and substantial profits to your organization while providing the proof of your recognition and appreciation for our efforts in the gas industry.

Gazomet Sp. z o.o. is a manufacturer of pressure vessels:

- gas filters, dust and liquid separators, heatexchangers, combined filter-heatexchangers
- pig launchers and receivers, condensate tanks.

We manufacture pressure vessels in accordance with:

- own technical documentation,
- customer's technical documentation,
- documentation elaborated in accordance with the customers' technical foundations.

All manufactured pressure vessels meet the Pressure Equipment Directive 97/23/EC requirements and are manufactured with the supervision of Technical Supervision Office UDT. The pressure vessels are marked with CE sign.

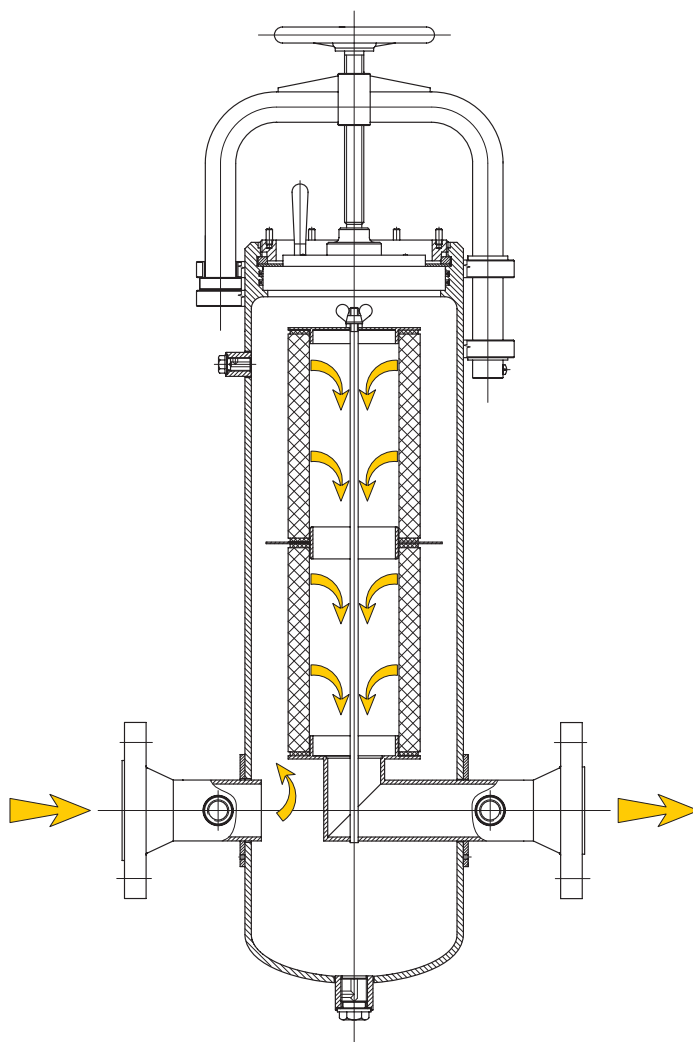


Design and principle of operation

Gas filters type F, FG and FGP equipped with cellulose filter cartridges are made as welded steel units. Technical Supervision Office UDT recommendations for pressure vessels and the requirements of the Pressure Equipment Directive 97/23/EC are followed during the design and strength calculations of our pressure vessels.

The below cross-section illustrates the principle of operation of gas filter. Contaminated gas flows into the filter body through the inlet pipe. The filter construction provides the preliminary separation of the heaviest solid contaminants, as the contaminants fall down as the result of gas velocity reduction while entering a bigger diameter zone (the shell) from the smaller diameter zone (inlet pipe). The remaining contaminants are trapped on the surface of the filter cartridge.

The flow capacity of the filters are selected in the way to protect the filter cartridges against velocity higher than 2 m/s; the maximum gas velocity in the inlet and outlet pipes should be 20 m/s.



Gas filter cross section

In most technological processes in which gas media are used it is necessary to use very clean gas. In most cases F or FG filters are sufficient. However, they are insufficient if gas, in addition to solid contaminants, contains also liquid fractions. In such situations it is necessary to clean gas in two stages – first from the liquid and then from dust and solid contaminants. FGWS filter separator serves this purpose.

Design and principle of operation

Dust and liquid particle separators are made as vertical units. Their function is to separate the solid particles and liquids from the gas stream, using the kinetic energy of the gas stream.

The separator is a welded steel unit, as shown in the picture. UDT recommendations applying to pressure tanks are followed during the design and strength calculations. Liquid fractions are separated in the wet part (axial cyclone), to which gas flows through the inlet pipe. Subsequently, gas flows to the dry part, where it is filtered. In the inlet pipe gas velocity should be at least 10 m/s. At the inlet to the part, which separates liquid particles, gas is whirled by the blades. The velocity in the whirl is increased towards the inside of the whirl. This is an effect similar to that observed when water is emptied from a bathtub. Inertial forces acting on dust and liquid particles are several times higher than the forces of gravity.

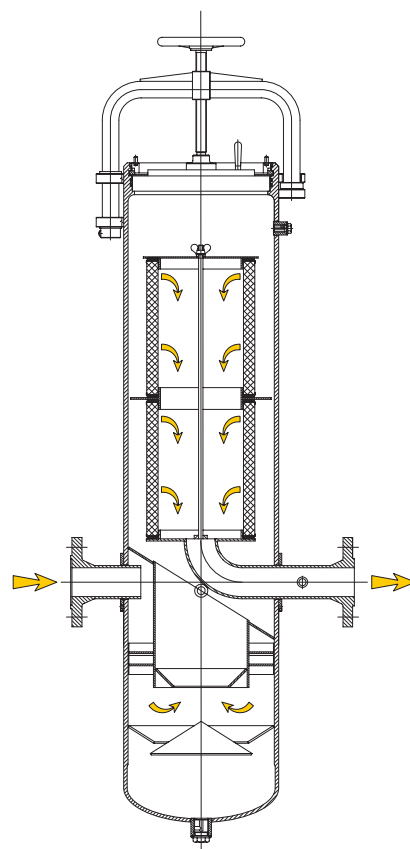
In this situation contaminant particles are thrown against the outer wall of the separator body. Since in the near-wall layer gas velocity is small, forces of inertia decrease. The distribution of pressure in the gas whirl (higher pressure in the outer part of the whirl) induces a second flow of gas stream towards the gas whirl. This stream picks up contaminant particles, preventing against deposits being left on the body walls. The contaminants flow in the main gas stream until the forces of gravity exerted on the particle are balanced with the force, which is the result of the difference of pressures in the whirl. Subsequently, due to the dominant influence of the forces of gravity, they fall to the separator bottom. A wall built at half the height of the separation part prevents the particles from being taken by the gas stream. Now the gas stream flows up the separator, where it is additionally cleaned in the filter cartridge, and then it leaves the filter separator through the outer pipe.

Separation effectiveness

FGWS filter separators are highly efficient in gas cleaning. They combine the features of cartridge filters and axial cyclones. Their effectiveness is, respectively,

- liquids – 99.5% for particles bigger than 10-12 μm ;
- solid particles – 99.8% for particles bigger than 5 μm (optional 2 μm).

The effectiveness for liquids is achieved at gas velocity in the inlet pipe of the separator of at least 10 m/s. At a low gas velocity, fewer liquid particles are separated from gas; separation takes place in the filter cartridge. But in this case, and especially when the liquid has a high viscosity (oils, greases, etc.) the cartridge is soiled or even clogged much faster. The effectiveness of solid particle separation in the filter cartridge does not depend on gas velocity in the inlet pipe.



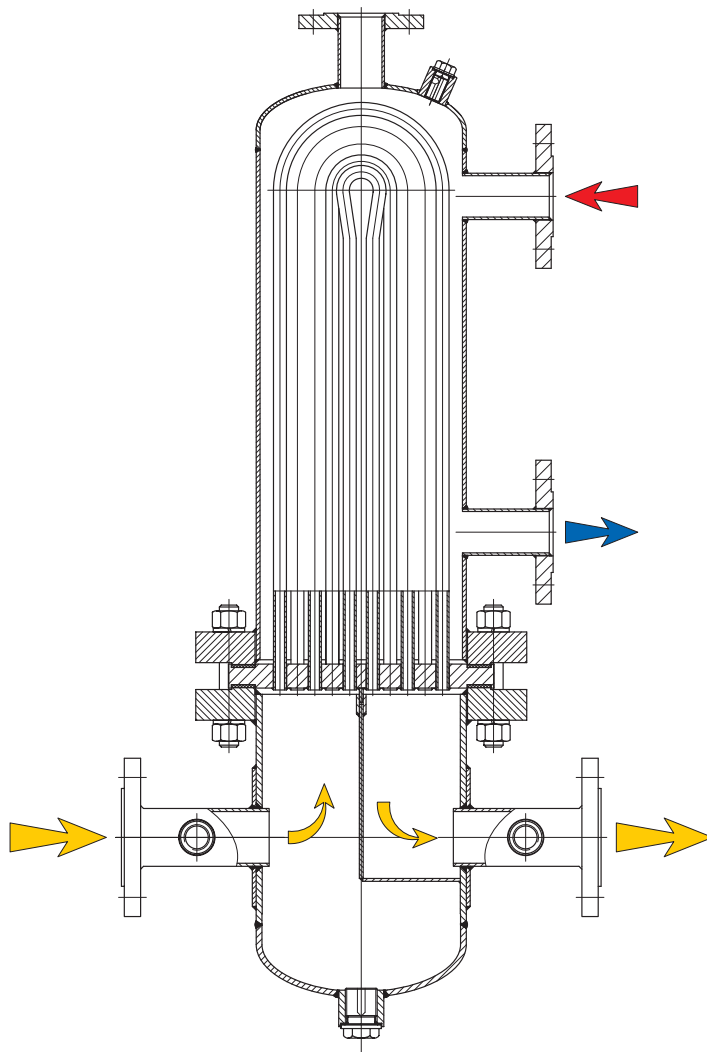
Dust and liquid separator FGWS cross section

Heating of the natural gas

During gas pressure regulation, as a result of expansion, gas temperature is significantly reduced. As a result of this regulation, regulation units, and particularly the units, which control the work of regulators built into the 1st degree (high pressure) regulation stations, can be frosted or even frozen. In order to ensure defect free work of gas regulation stations, it is necessary to heat the gas before regulation to a temperature high enough so that after regulation the temperature is in the range of $+5^{\circ}\text{C}$ and $+10^{\circ}\text{C}$. Natural gas in regulation stations is most often heated by flow heaters, in which water, being the heat carrying agent, is used as the heating medium.

Gas heating

Heating is effected through the exchange of heat between the heating medium and the gas, which flows through the pipe bundle. The temperature of the heating medium in the exchanger is adjusted depending on the gas temperature after the regulation unit. When the circulating pump of the heating medium is built up, heat transfer and adjustment accuracy are better. The circulating pump permits better use of the heat exchange area; the diameters of the pipelines that carry the heating medium can be significantly reduced.



Heatexchanger PG cross section

Heatexchangers operating parameters

Gas inlet pressure (calculated): standard – PN16; PN25; PN63; PN100

Heating medium:

- water,
- calculated pressure of the heating part:
standard PN6; PN63,
- inlet temperature +90°C,
- outlet temperature +70°C.

Safety equipment

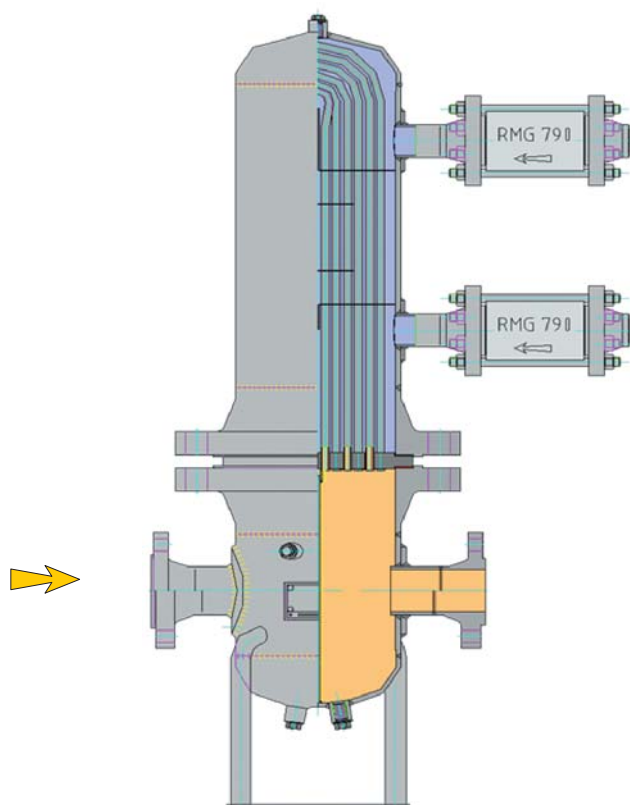
Heat exchangers feature a pipe on the water shell bonnet, which is used to connect protection fittings. If one of the heating tubes with gas breaks, gas can be released into the atmosphere via the head of the safety valve. The standard pipe features a flat face flange and has been designed to withstand PN16 pressure.

If the water part has been designed to withstand gas pressure, it is protected with the RMG790 valve, which is set to the maximum pressure of the heating medium in the boiler house. Leaking gas is stopped in the water part of the heater.

Design and principle of operation

Standard design gas heaters feature heating tubes welded into the perforated bottom, placed between the gas chamber flange and the water shell flange of the heating medium. These parts can be replaced at any time. Cold gas flows out through the pipe and the inlet chambers into heating tubes. When heated, the gas flows through the chamber and the outlet pipe into the pipeline system. The heating medium flows through a number of directional partitions located around the heating pipes. They are welded into the perforated bottom designed to withstand the actual gas pressure.

The gas chamber of the exchanger features condensate releasing pipes. The perforated bottom features a tap to release the remainder of the heating medium from the space below the outlet pipe.



Heatexchanger PG cross section

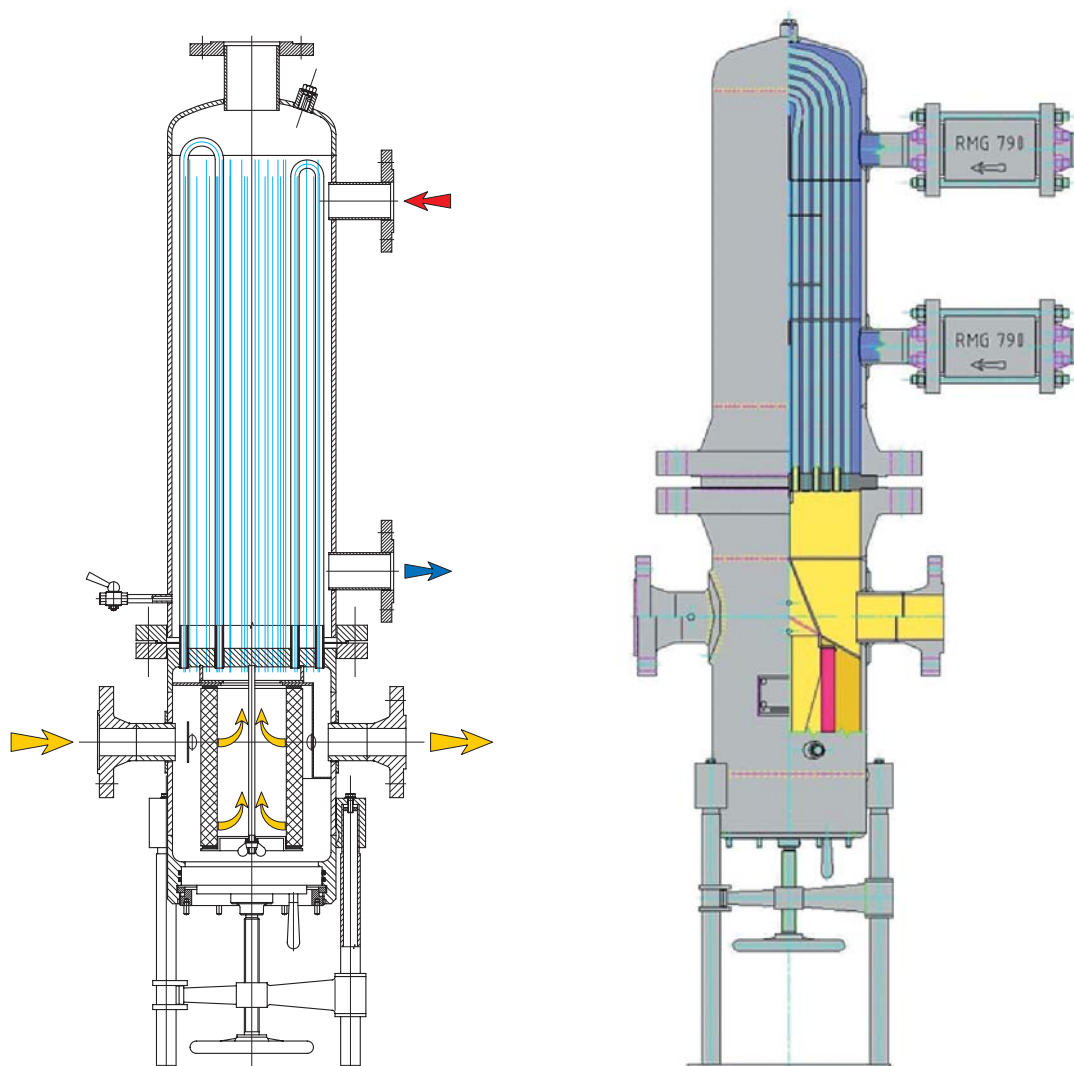
Design and principle of operation

FGWC combined filters-heatexchangers integrate two functions: solid particles filtration and gas heating. They are made as a welded steel unit.

The cross section illustrates the operating principle. Contaminated gas flows into the filter heater body through the inlet pipe. As the velocity of the gas stream flow changes, thicker contaminants fall to the bottom of the unit's gas part. The remaining contaminants are separated when gas flows upwards and is deposited on the outer part of the filter. From the inner part of the filter gas is directed to the outlet pipe, through a system of tubes immersed in a hot bath (where it is heated).

Safety features

On the water shell bonnet the gas filter heaters feature a pipe to which safety fittings are connected. Should the exchange pipe break, the leaking gas can be released into the atmosphere through e.g. RMG 790 safety valve. The standard pipe is made with a flat face flange to withstand PN16 pressure.



Combined filters-heatexchangers FGWC cross section

GD filter cartridges

Standard high and medium pressure gas filters feature cellulose filter cartridges GD or GDW. In GD (GDW) cartridges gas is filtered through a star shaped cellulose paper, impregnated with single stage resin. This makes the filter resistant to dampness and mechanical damage, e.g. breaking. The active filtration surface of filter cartridges made of pressed cellulose paper is 4 to 5 times greater than that of felt filters. On the inner and outer sides the filtration material is protected with a perforated sheet. The picture shows filters protected with a zinc-coated sheet. These filters are not sufficiently resistant to such aggressive media as, for example, biogas. Filters protected with a stainless steel net are used to filter aggressive or caustic gases. Both bottoms feature felt rings, which separate the inflowing contaminated gas from the "clean" zone. The sizes of the filters are given in the table below. The cleaning accuracy of standard filter cartridges is up to $5\mu\text{m}$; it is possible to order custom made accuracy of $2\mu\text{m}$.



Wkłady filtracyjne

WKŁADY TYPU GD				
Typ	m ²	mm		
	Powierzchnia:	D	d	H
GD 0,1	0,2	62	42,5	108
GD 1	0,8	98	46	180
GD 1,5	1,1	122	62	220
GD 2	1,4	165	114	260
GD 3	3	250	194	320

WKŁADY TYPU GDW				
Typ	m ²	mm		
	Powierzchnia:	D	d	H
GD3W2	9	250	194	640
GD4W2	15	282	220	800
GD5W2	21	340	270	800

Examinations, tests and acceptance of pressure equipment

Examinations, tests and acceptance of pressure equipment

In line with the regulations issued by the Technical Supervision Office (UDT), the current factory design instructions, the Technical Standards IGG (Izba Gospodarcza Gazownictwa)

Maintenance of pressure equipment

All pressure equipment ready for acceptance has metallically clean surfaces. Following positive acceptance, outer surfaces are covered with a few coats of priming epoxy grey paint and epoxy yellow topcoat paint.

Materials

The standard version of the equipment is made of materials, which meet UDT approved resistance parameters for nominal pressures.

All the basic materials carry metallurgical certificates and the main components of the filter feature stamped material grade and melt number.

Note! Filters using acid resistant or stainless steel can be custom made upon request.

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